

Application No. 10/619,868  
Amendment Dated: December 28, 2004  
In response to Office Action Dated October 8, 2004

### **REMARKS**

The Office Action mailed October 8, 2004, has been carefully considered by Applicant. Reconsideration is respectfully requested in view of the foregoing claim amendments and the remarks that follow.

Claims 1-3, 7-9, 11-15 and 18 are pending.

Claims 7, 12, 13 and 18 are amended.

Claims 4-6, 10, 16, 17 and 19 are canceled.

### **Examiner Interview**

Applicant respectfully requests an Examiner Interview regarding the present application. Applicant is of the opinion that there are clear distinctions between the present invention, as defined in the foregoing claims, and the prior art references cited by the Examiner. Applicant would like to discuss this matter further with the Examiner to clear up any misunderstanding. Prior to the interview, Applicant respectfully requests that the Examiner consider the following remarks.

### **Allowable Claims**

Claims 12 and 18 are indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. By the present Amendment, claims 12 and 18 are rewritten in independent form and include all of the limitations of the base claim and any intervening claims. As such, claims 12 and 18 are believed in condition for allowance.

### **Claim Rejections**

Claims 1-3 and 7 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Baker Great Britain Patent No. 2,029,005 in view of Lee U.S. Patent No. 5,274,245. Claims 8, 9 and 11 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Baker '005 in view of Lee '245, and further in view of Smith U.S. Patent No. 4,956,560. Claims 14 and 15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Baker '005 in view of Lee '245, and further in view of Hastbacka U.S. Patent No. 4,051,726. Claims 13 and 19 have been rejected under 35 U.S.C. §102(b) as being anticipated by Baker '005.

Application No. 10/619,868  
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By the present Amendment, claim 19 has been canceled, thus rendering the rejection regarding claim 19 moot.

Independent Claims 1 and 2

Claims 1 and 2 recite a level detector that can measure liquid level using multiple light emitters and multiple light receivers. In claim 1, each light receiving device is operable to receive light via respective light paths from at least two adjacent light emitting devices. In other words, at least two light emitters can illuminate the same light sensor. In claim 2, each light emitting device is operable to illuminate, via respective light paths, each of at least two adjacent light receiving devices. In other words, one light receiver can illuminate at least two sensors. In both embodiments, a circuit is provided that can determine whether light is received via each of the respective light paths. By using a single sensor or emitter to monitor (at least) two different light paths, the total number of devices needed is substantially reduced. See for example, page 4, lines 13-22 of the present application:

According to a further preferred feature of the invention, each receiver is operable to receive light from at least two emitters at respective different heights, the emitters being, in use, operated at different time intervals. Thus, a single receiver can indicate whether or not the liquid has reached any of two different levels. Additionally, or alternatively, each emitter is arranged to illuminate two separate receivers, each of which can be enabled in respective different periods. Accordingly, a single emitter can be used for determining whether the liquid has reached either of two different levels. By combining these features, for a given resolution, the number of emitters and receivers can be halved, thus further reducing costs.

None of the cited prior art, taken individually or in combination, discloses a structure in which such an advantage can be achieved.

As established in Applicant's previous response, Baker '005 fails to teach or suggest a circuit that can determine whether light is received via each of a plurality of paths from respective light emitters (or to respective sensors). In the present Office Action, the Examiner cites Lee '245 as teaching this aspect of the claimed invention.

However, Lee '245 only discloses an arrangement which requires two emitters and a single sensor for measuring liquid at a single level. If such an arrangement were combined with Baker '005, one would then need three devices (two emitters and one sensor) for each monitored level. Such an arrangement is even less desirable than the arrangement taught by Baker '005, which teaches two devices (one emitter and one receiver) for each level, and considerably less desirable than the present invention, in which, at worst, three devices are capable of detecting liquid at two different levels.

The Examiner refers to Lee '245 as teaching a circuit "discriminating upper and lower emitters". However, there is absolutely no teaching or suggestion of any "discriminating" of emitters in Lee '245. Lee teaches two emitters which are operated in anti-phase to illuminate the sensor (32). When the circuit is in balance, the output of the sensor is flat because of the anti-phase relationship of the emitter drive signals. However, if more light is received from one emitter than from the other, the signals are out of balance. This causes an AC signal to be produced by the sensor, which is amplified to generate an output signal. However, there is no way in which the circuit is capable of discriminating between the different light paths. The same output signal would be generated irrespective of which path reflects the most light. Therefore, there is no "discriminating" and the circuit of Lee '245 cannot "determine whether light is received by each light path".

Claim 2 is further distinguished in that it requires that each emitter be capable of illuminating at least two sensors via respective light paths, the circuit being capable of determining whether light is received via each of those light paths. This is not suggested in any of the prior art, and indeed is quite contrary to the teachings of Lee '245.

### Claim 3

Claim 3 depends from claim 2 and thus is believed allowable for the reasons stated above, as well as the subject matter recited therein.

### Claims 7-9 and 11

Independent claim 7 has been amended and now recites "a control circuit for deriving a reading from a light receiving device, the reading being dependent upon the

Application No. 10/619,868  
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relationship between an ambient measurement taken when no light emitting device capable of illuminating the light receiving device is operating and an operational measurement taken when a light emitting device capable of illuminating the light receiving device is operating."

Regarding the Examiner's statements in paragraph 8 of the Office Action, please note that the Applicant has never suggested "that no readings are being taken when no light reaches the detector". The point is that in Baker '005 no readings are taken from a sensor except when the corresponding emitter is operated. Therefore, unlike the present invention, the true ambient reading is never taken. It is respectfully believed that the Examiner is mistaken in two points:

- The reading taken from the sensor when the light is "externally transmitted and not returning to the detector" will be influenced by any light scattered towards the sensor, which will include light originating at the emitter as well as ambient light. It is therefore not a true ambient light reading.
- All readings taken from the sensor will be dependent only upon the sensor measurement at that time. It is true that, in Baker '005, the possibility of level detection depends upon the sensor measurements being different depending upon the presence or absence of liquid. However, each reading is itself independent.

This difference is emphasized by the present amendment to claim 7, which reads: "when no light emitting device capable of illuminating the light receiving device is operating". Claims 8, 9 and 11 depend directly or indirectly from claim 7 and are thus believed allowable for the reasons stated above, as well as the detailed subject matter recited therein.

#### Claims 13 and 15

Independent claim 13 has been rejected despite the distinguishing features mentioned in the previous response, because in the Examiner's opinion the features are disregardable in view of the fact that method limitations are only considered to have

Application No. 10/619,868  
Amendment Dated: December 28, 2004  
In response to Office Action Dated October 8, 2004

patentable weight if the apparatus is capable of performing the methods. Accordingly, claim 13 has been amended into method claim format. In addition, the claim has been further amended to include the limitations of former claim 19, which is canceled by the present amendment.

Claim 13 is thus believed allowable for the reasons stated in the previous response regarding claim 13. For example, amended claim 13 recites that the control circuit is used to determine the extent of immersion of the level detector within a liquid by performing a search procedure involving checking whether an intermediate level is immersed and then checking alternately higher and lower levels, locating the highest sensor whose output indicates immersion and checking that at least one lower sensor also has an output indicating immersion. This method avoids errors caused by drips erroneously indicating a higher level rather than the actual level. Such an arrangement is neither taught nor suggested by any of the applied references.

Claim 15 depends directly from claim 13 and is thus believed allowable for the reasons stated above, as well as the subject matter recited therein.

Claim 14


Claim 14 depends from claim 1 and is thus believed allowable for the reasons stated above, as well as the subject matter recited therein.

Conclusion

The present application is thus believed in condition for allowance. Such action is respectfully requested.

Respectfully submitted,

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